

**Quality Assurance Report
on Exotic Plants:
EMAP Western Pilot Field Sites in
Montana**

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TABLE OF CONTENTS

TABLE OF CONTENTS.....	i
INTRODUCTION	1
METHODS	1
Data Management	2
RESULTS	2
Relocating Quality Assurance Sites	2
Target Exotic Species Encountered	3
Legacy Trees	3
Other Species including exotics not listed as targets	3
REFERENCES	4

INTRODUCTION

This is an analysis and report on the EMAP Western Pilot Quality Assurance (QA) inventory conducted by the Montana Natural Heritage Program (MTNHP) during the 2001 field season. The purpose of this work is to assist in the evaluation of the quality and value of exotic plant and legacy tree information collected by Montana Department of Environmental Quality (MTDEQ). Six wadeable streams inventoried by MTDEQ in 2001 and included in this report are Fred Burr Creek, Hungry Horse Creek, Little Boulder Creek, Moose Creek, South Fork Little Joe Creek, and an un-named tributary of the Tenderfoot River.

METHODS

The quality assurance work was completed during the same field season that MTDEQ completed their inventory. After the initial inventory was done, Rose Sade at MTDEQ contacted MTNHP with the exact GPS location for the plot or site center. With this information plotted on a 1:24,000 quad map and a GPS unit, MTNHP staff was able to relocate the exact plot center. The location was confirmed by flagging left by MTDEQ.

Two ecologists for MTNHP conducted the quality assurance inventory; Catherine Jean, Ecology Program Manager, has a MS in Forest Ecology from Utah State University and has worked professionally as a botanist and ecologist for 11 years; Steve Cooper has a PhD in Botany from Washington State University and has worked professionally as an ecologist for 26 years. As professional ecologists, Catherine and Steve spend most of each summer identifying plants while conducting ecological surveys. Steve is very familiar with local flora, having worked in Montana for 18 years; Catherine is less familiar, having worked in Montana for three field seasons. Steve was able to identify all plants to species, while Catherine was able to identify all plants to genus and most to the species level.

We followed the quality assurance protocol set forth in the task description dated May 22, 2001 (PO # 0B0368NTNA Change 1). Specifically we:

1. Recorded the presence of the following nine species in 22 10 m x 10 m plots.

Table 1. Target Exotic Species

Species	Scientific name	Code
Canada Thistle	<i>Cirsium arvense</i>	CTH
Cheatgrass	<i>Bromus tectorum</i>	CHE
Common burdock	<i>Arctium minus</i>	BUR
English Ivy	<i>Hedera helix</i>	IVY
Leafy Spurge	<i>Euphorbia esula</i>	LSP
Musk Thistle	<i>Carduus nutans</i>	MTH
Russian-olive	<i>Elaeagnus angustifolia</i>	ROL
Salt Cedar	<i>Tamarix spp.</i>	SCD
Teasel	<i>Dipsacus fullonum</i>	TEA

2. Recorded the “legacy tree” visible from each MTDEQ plot. The tree species, (later normalized to the taxonomic affiliation) height, diameter at breast height (dbh), and distance from the stream were obtained

based on a visual estimate and recorded using the following: **DBH categories** (**1** = <0.1 m, **2** = 0.1 to 0.3 m, **3** = 0.3 to 0.75 m, **4** = 0.75 to 2.0 m, **5** = > 2m). **Height Categories** (**1** = <5 m, **2** = 5-15 m, **3** = 15-30 m, **4** = > 30m).

Table 2. The taxonomic affiliation and codes used to describe legacy trees.

SPECIES AFFILIATION	CODE
Alder/Birch	ALD
Ash	ASH
Cedar/Cypress/Sequoia	CED
Fir, Doug Fir, Hemlock	FIR
Juniper	JUN
Maple/Boxelder	MAP
Pine	PIN
Poplar/Cottonwood	POP
Spruce	SPR
Sycamore	SYC
Willow	WIL
other broadleaf evergreen	UEV
other conifer	UCO
other deciduous	UDE

3. Recorded the presence of all visible plant species within 10 m on both sides of the stream in 100-m increments along the stream reach. The number of transects completed per site ranged from 2 to 4, depending upon difficulty and time spent completing tasks 1 & 2 and the distance and time required to arrive at the next work site.

Data Management

Field data gathered for steps 1 and 2, exotic species and legacy data, were entered into excel worksheets; each worksheet represents a sampled stream section. These worksheets are included as Appendix A in this report. Field data gathered for step 3, plant species list for 100 m increments, were entered into an Access database, exported to excel and summarized by site. These results are presented in Appendix B. Electronic copies of the field forms populated with field data and the summary data in Appendix B are copied to a CD ROM located on the inside of the back cover page of this report.

RESULTS

Relocating Quality Assurance Sites

The MTNHP completed six quality assurance sites in 2001. We relocated the plot center of each stream reach and the center of each plot. In one instance (Tenderfoot – headwaters WMTP99-0521), flagging was missing from a downstream plot; here we estimated plot center by splitting the distance between the next upstream and downstream plots.

Target Exotic Species Encountered

Only one target species, Canada thistle (*Cirsium arvense*), was found. We encountered this species three times, once at Little Boulder Creek (WMTP-99-0633) and twice at South Fork Little Joe Creek (WMTP-99-0608). In both cases, the thistle was a single vegetative stem (without flower or fruiting structures) growing in fresh sand/gravel bar deposits. It is possible the stem emerged following the original survey. The results of the target exotic species inventory are summarized in Table 3.

Table 3. Matrix table summarizing the number of plots the target alien species was recorded by site. The Stream ID along the upper row of the matrix identifies sites.

SPECIES	WMTP99-0607	WMTP-99-0521	WMTP-99-0609	WMTP-99-0633	WMTP-99-0608	WMTP-99-0600
Canada Thistle	0	0	0	1	2	0
Cheatgrass	0	0	0	0	0	0
Common burdock	0	0	0	0	0	0
English Ivy	0	0	0	0	0	0
Leafy Spurge	0	0	0	0	0	0
Musk Thistle	0	0	0	0	0	0
Russian-olive	0	0	0	0	0	0
Salt Cedar	0	0	0	0	0	0
Teasel	0	0	0	0	0	0

Legacy Trees

We recorded legacy trees from each MTDEQ plot. We followed the sampling protocol where the largest tree within the riparian zone (restricted to a distance of 50 m) was recorded on both left and right bank. Observations were made from each plot to the next upstream plot and recorded in the plot from which the observation was made. Overall the legacy tree data was the hardest to ensure accuracy. For example, a stream could meander so that one legacy tree plot was within another – assuming the plot was at right angles with the stream direction. Another problem arises from the subjective decision of where the riparian zone ends, especially when dense vegetation obscures the understory indicators. Nevertheless, we have very high confidence in the tree species, or affinity and whether the tree was alive or dead. We have relatively high confidence in the tree height estimates since the variable is placed in a category. The diameter at breast height was at times obscured by dense vegetation; therefore we have less confidence in this value.

Other Species including exotics not listed as targets

We completed seventeen 100-m transects where we recorded all recognizable plant species within 10 m on either side of the stream. A minimum of two transects were completed at each site; these transects were numbered 5 & 6 where plot 5 was located in the 100-m stretch upstream from plot center and plot 6 was located in the 100-m stretch downstream from plot center. Most plant species were identified while standing in the stream center; in some cases, specimens were collected to inspect flowering parts. A few specimens were run through taxonomic key for verification.

We documented fifteen plant species known to be exotic in Montana. To be certain that we didn't overlook any exotic species, we queried an ACCESS database used at the MTNHP that originated from

the USFS Region 1 office in Missoula, Montana in 1998. This database contains an 'Origin' field where E = exotic. We also queried our species list against the INVADER database (Rice, P.M. 2001) housed at Montana State University. This database is a good source for exotic and noxious species for Montana. These results concurred with the results obtained from the USFS R1 database with two exceptions: Smooth Brome (*Bromus inermis*) and Common mouse-ear chickweed (*Cerastium fontanum*) were not listed as exotic species. We doubled checked these species accounts on the NatureServe web site (2001) and found both species were listed as exotic in Montana. Finally, we obtained a recent Forest Service report titled 'Evaluating Risk to Native Plant Communities from Invasion of Selected Exotic Plant Species' (Mantas and Jones, 2001). This document is a report on a 2001 expert workshop that identified the potential invasiveness of exotic species into natural communities in Western Montana. A similar report for Eastern Montana will be available in 2001. The results of these inquiries are presented in Table 4.

Table 4. Exotic species documented along 100-m intervals.

Species	USFS R1 exotics	Invaders db noxious in:	USFS R1 Invasive Risk ¹
<i>Bromus inermis</i>	e	e	
<i>Agrostis stolonifera</i>	e	e	
<i>Centaurea maculosa</i>	e	ID,MT,OR,WA,WY	IH,DL,CN
<i>Cerastium fontanum</i>	e	e	
<i>Chrysanthemum leucanthemum</i>	e	MT,WA,WY	
<i>Cirsium arvense</i>	e	ID,MT,OR,WA,WY	CN,DL,DH
<i>Conium maculatum</i>	e	ID,OR,WA	
<i>Dactylis glomerata</i>	e	e	
<i>Medicago falcata</i>	e	e	
<i>Phleum pratense</i>	e	e	
<i>Poa palustris</i>	e	e	
<i>Poa pratensis</i>	e	e	
<i>Tanacetum vulgare</i>	e	MT,WA	CN,UU,DL,DH
<i>Taraxacum officinale</i>	e	e	

¹ First code is the Susceptibility (C = Closed, D = Disturbance, I = Invasive, U = Unknown susceptibility); Second code is the Threat (N = no threat, L = low threat, H = high threat, U = Unknown threat). Multiple values indicate the species susceptibility to invasion differs for different community types.

All other species (including alien) recorded along the 10-m by 100-m stream increments are presented in Appendix B.

REFERENCES

Mantas, M.; and J. Jones, 2001. Evaluating Risk to Native Plant Communities from Invasion of Selected Exotic Plant Species. A proposal for the Western Montana Planning Zone. Flathead National Forest, Montana. Unpublished Report available at the Montana Natural Heritage Program.

NatureServe, 2001. NatureServe Explorer: Online Encyclopedia of Life (<http://www.natureserveexplorer.org/>) Data accessed on November 13, 2001.

Rice, P.M. 2001. INVADERS Database System (<http://invader.dbs.umt.edu>). Division of Biological Sciences, University of Montana, Missoula, MT 59812-4824. Data accessed on November 13, 2001

ERRATUM ¹

Appendix B. Species encountered along 100 m increments

All species observed in 10-m by 100-m increments along the MTDEQ site. Cells show the number of times the species was recorded by site. The number of increments completed in each site is in parenthesis. Exotic species are shaded across the row.

Species	WMTP99-521 (4)	WMTP99-600 (2)	WMTP99-607 (3)	WMTP99-608 (2)	WMTP99-609 (4)	WMTP99-633 (2)
<i>Abies grandis</i>	0	1	3	2	0	0
<i>Abies lasiocarpa</i>	2	0	0	0	4	0
<i>Acer glabrum</i>	0	1	1	0	0	0
<i>Achillea millefolium</i>	4	1	1	0	0	1
<i>Actaea rubra</i>	0	0	0	2	2	2
<i>Agoseris glauca</i>	3	0	0	0	0	0
<i>Agrostis scabra</i>	4	0	0	0	0	0
<i>Agrostis spp.</i>	4	2	3	2	0	0
<i>Agrostis stolonifera</i>	0	1	0	1	0	0
<i>Allium spp.</i>	2	0	0	0	0	0
<i>Alnus incana</i>	0	0	0	0	4	0
<i>Alnus sinuata</i>	0	2	3	2	0	0
<i>Alnus spp.</i>	0	0	0	0	0	2
<i>Alopecurus spp.</i>	0	0	1	0	0	0
<i>Amelanchier alnifolia</i>	0	1	3	1	0	0
<i>Anaphalis margaritacea</i>	0	2	3	2	0	0
<i>Angelica arguta</i>	2	0	0	0	4	0
<i>Angelica dawsonii</i>	0	0	3	0	0	0
<i>Angelica spp.</i>	0	2	0	2	0	2
<i>Antennaria racemosa</i>	0	0	0	0	1	0
<i>Antennaria spp.</i>	4	1	0	0	0	2
<i>Aralia nudicaulis</i>	0	1	1	0	0	0
<i>Arctostaphylos uva-ursi</i>	0	0	0	0	3	0
<i>Arnica cordifolia</i>	0	0	0	0	4	0
<i>Arnica spp.</i>	0	0	0	0	0	2
<i>Aster conspicuus</i>	0	0	0	0	3	0
<i>Aster engelmannii</i>	0	0	0	0	4	0
<i>Aster foliaceus</i>	4	0	0	0	4	0
<i>Aster laevis</i>	0	0	0	0	4	0
<i>Aster modestus</i>	0	0	0	0	4	0
<i>Aster occidentalis</i>	0	0	0	0	4	0
<i>Astragalus spp.</i>	1	0	0	0	0	2
<i>Berberis repens</i>	0	0	0	0	3	0
<i>Betula occidentalis</i>	0	1	0	0	0	0
<i>Brickellia grandiflora</i>	0	0	0	2	0	0

¹ The following changes have been made. WMTP99-608 – *Chrysanthemum leucanthemum*, *Dactylis glomerata* and *Parnassia spp.* from 3 to 2. WMTP99-600 and 633 – *Salix spp.* from 3 to 2.

Species	WMTP99- 521 (4)	WMTP99- 600 (2)	WMTP99- 607 (3)	WMTP99- 608 (2)	WMTP99- 609 (4)	WMTP99- 633 (2)
<i>Bromus carinatus</i>	4	0	0	0	0	0
<i>Bromus ciliatus</i>	2	0	2	0	4	0
<i>Bromus inermis</i>	0	0	1	2	0	0
<i>Bromus spp.</i>	2	0	0	1	0	1
<i>Bromus vulgaris</i>	0	0	0	0	4	0
<i>Calamagrostis canadensis</i>	4	0	0	0	4	0
<i>Calamagrostis rubescens</i>	0	0	0	0	3	0
<i>Calamagrostis spp.</i>	0	2	2	0	0	2
<i>Calochortus spp.</i>	3	0	0	0	0	0
<i>Campanula rotundifolia</i>	1	0	2	0	0	2
<i>Carex geyeri</i>	0	0	0	0	4	1
<i>Carex microptera</i>	4	0	0	0	0	0
<i>Carex scopulorum</i>	4	0	0	0	0	0
<i>Carex spp.</i>	0	1	1	1	0	0
<i>Castilleja linariifolia</i>	0	0	1	0	0	0
<i>Centaurea maculosa</i>	0	0	1	1	0	0
<i>Cerastium fontanum</i>	0	2	0	2	0	0
<i>Chimaphila umbellata</i>	0	0	0	0	2	0
<i>Chrysanthemum leucanthemum</i>	0	0	1	2	0	0
<i>Circaea alpina</i>	0	0	0	2	0	0
<i>Cirsium arvense</i>	0	0	0	1	0	1
<i>Cirsium scariosum</i>	3	0	0	0	0	0
<i>Cirsium spp.</i>	0	0	2	0	0	0
<i>Clematis columbiana</i>	0	1	0	0	0	0
<i>Clintonia uniflora</i>	0	1	1	2	0	0
<i>Collomia spp.</i>	3	0	0	0	0	0
<i>Conium maculatum</i>	0	0	0	1	0	0
<i>Coptis occidentalis</i>	0	0	0	2	0	0
<i>Cornus canadensis</i>	0	2	1	0	0	0
<i>Cornus sericea</i>	0	2	3	2	4	2
<i>Crepis runcinata</i>	0	0	1	0	0	0
<i>Crepis spp.</i>	0	0	0	0	0	2
<i>Dactylis glomerata</i>	0	0	1	2	0	0
<i>Danthonia californica</i>	4	0	0	0	0	0
<i>Danthonia spp.</i>	0	0	0	0	0	1
<i>Deschampsia cespitosa</i>	4	0	0	0	0	0
<i>Disporum spp.</i>	0	2	1	0	0	0
<i>Dodecatheon spp.</i>	2	0	0	0	0	0
<i>Elymus glaucus</i>	0	2	3	0	4	0
<i>Elymus trachycaulus</i>	2	0	0	0	0	0
<i>Epilobium angustifolium</i>	3	2	0	2	4	2
<i>Epilobium ciliatum</i>	4	2	3	0	0	2
<i>Equisetum arvense</i>	1	2	3	0	0	2
<i>Erigeron foliosus</i>	0	2	3	0	0	0

Species	WMTP99- 521 (4)	WMTP99- 600 (2)	WMTP99- 607 (3)	WMTP99- 608 (2)	WMTP99- 609 (4)	WMTP99- 633 (2)
<i>Erigeron spp.</i>	0	1	0	0	0	2
<i>Festuca idahoensis</i>	2	0	0	0	0	0
<i>Festuca spp.</i>	0	0	0	0	0	2
<i>Fragaria spp.</i>	0	2	0	0	0	2
<i>Fragaria virginiana</i>	4	0	0	0	0	0
<i>Galium boreale</i>	0	2	3	2	2	0
<i>Galium spp.</i>	0	1	0	0	0	2
<i>Galium triflorum</i>	0	0	0	0	4	0
<i>Geranium richardsonii</i>	0	0	1	0	0	0
<i>Geranium viscosissimum</i>	4	0	0	0	0	2
<i>Geum macrophyllum</i>	4	2	2	2	0	0
<i>Geum spp.</i>	0	0	0	0	0	1
<i>Glyceria spp.</i>	0	1	3	1	0	1
<i>Goodyera oblongifolia</i>	0	1	0	2	1	0
<i>Habenaria dilatata</i>	0	1	0	0	0	0
<i>Habenaria spp.</i>	3	0	0	1	0	0
<i>Heracleum lanatum</i>	0	1	3	2	4	2
<i>Heuchera spp.</i>	0	0	0	0	0	2
<i>Hypericum spp.</i>	0	0	1	1	0	0
<i>Juncus confusus</i>	3	0	0	0	1	2
<i>Juncus spp.</i>	1	0	0	1	0	0
<i>Juniperus scopulorum</i>	0	0	0	0	0	2
<i>Lactuca spp.</i>	0	0	2	0	0	0
<i>Larix occidentalis</i>	0	2	0	0	0	0
<i>Ligusticum spp.</i>	0	0	0	0	2	0
<i>Linnaea borealis</i>	0	1	2	2	4	2
<i>Lonicera involucrata</i>	0	0	3	0	4	0
<i>Lonicera utahensis</i>	0	2	0	2	3	0
<i>Luzula spp.</i>	4	0	1	0	0	1
<i>Maianthemum racemosum</i>	0	0	0	0	2	0
<i>Maianthemum spp.</i>	0	0	0	2	0	0
<i>Maianthemum stellatum</i>	0	0	3	0	3	0
<i>Medicago falcata</i>	0	0	1	0	0	0
<i>Melica bulbosa</i>	4	0	0	0	0	0
<i>Mertensia ciliata</i>	4	0	0	0	0	0
<i>Mertensia spp.</i>	0	0	0	2	0	0
<i>Mimulus guttatus</i>	1	2	0	1	0	0
<i>Mimulus lewisii</i>	0	0	1	1	0	0
<i>Mimulus spp.</i>	0	0	1	0	0	0
<i>Mitella pentandra</i>	0	0	0	0	3	0
<i>Mitella spp.</i>	0	0	0	1	0	0
<i>Osmorhiza chilensis</i>	0	0	0	0	4	0
<i>Osmorhiza depauperata</i>	0	1	0	0	0	0
<i>Osmorhiza spp.</i>	0	0	0	2	0	0

Species	WMTP99- 521 (4)	WMTP99- 600 (2)	WMTP99- 607 (3)	WMTP99- 608 (2)	WMTP99- 609 (4)	WMTP99- 633 (2)
<i>Pachistima myrsinites</i>	0	0	0	1	0	0
<i>Parnassia fimbriata</i>	0	0	0	0	4	0
<i>Parnassia</i> spp.	0	0	0	2	0	2
<i>Paxistima myrsinites</i>	0	0	2	0	0	0
<i>Pedicularis groenlandica</i>	4	0	0	0	0	0
<i>Penstemon</i> spp.	0	0	0	0	1	0
<i>Phleum alpinum</i>	4	0	0	0	0	0
<i>Phleum pratense</i>	0	0	3	0	0	0
<i>Picea engelmannii</i>	3	2	3	2	4	2
<i>Pinus contorta</i>	3	2	0	0	4	2
<i>Pinus monticola</i>	0	0	0	1	0	0
<i>Plantago</i> spp.	0	0	0	1	0	1
<i>Poa palustris</i>	0	1	0	0	0	0
<i>Poa pratensis</i>	0	0	1	0	0	0
<i>Populus balsamifera</i> ssp. <i>trichocarpa</i>	0	2	3	2	0	0
<i>Potentilla gracilis</i>	3	0	0	0	0	1
<i>Prunella vulgaris</i>	0	1	0	2	0	0
<i>Pseudotsuga menziesii</i>	0	0	1	0	4	2
<i>Pyrola asarifolia</i>	0	0	0	0	4	0
<i>Pyrola secunda</i>	0	0	0	0	4	0
<i>Pyrola</i> spp.	0	2	1	2	0	2
<i>Rhamnus alnifolia</i>	0	0	3	0	0	0
<i>Ribes lacustre</i>	0	2	3	2	4	2
<i>Rosa nutkana</i>	0	2	3	0	0	0
<i>Rosa</i> spp.	0	0	0	0	0	2
<i>Rubus idaeus</i>	0	0	2	0	4	0
<i>Rubus parviflorus</i>	0	2	3	2	4	2
<i>Salix drummondiana</i>	4	0	3	0	0	0
<i>Salix scouleriana</i>	0	0	0	0	4	0
<i>Salix</i> spp.	0	2	0	1	0	2
<i>Saxifraga</i> spp.	3	0	0	0	0	0
<i>Senecio cymbalarioides</i>	2	0	3	0	0	0
<i>Senecio serra</i>	4	0	0	0	0	0
<i>Senecio</i> spp.	0	1	0	0	0	0
<i>Senecio triangularis</i>	0	2	3	2	4	0
<i>Shepherdia canadensis</i>	0	1	0	0	1	0
<i>Solidago missouriensis</i>	0	0	1	0	0	0
<i>Solidago</i> spp.	0	1	0	1	0	0
<i>Sorbus scopulina</i>	0	0	2	0	4	0
<i>Spiraea betulifolia</i>	0	2	3	1	4	2
<i>Stellaria</i> spp.	1	0	0	0	0	0
<i>Streptopus amplexifolius</i>	0	1	3	2	4	2
<i>Symphoricarpos albus</i>	0	0	3	0	0	0
<i>Symphoricarpos</i> spp.	0	2	0	1	0	0

Species	WMTP99- 521 (4)	WMTP99- 600 (2)	WMTP99- 607 (3)	WMTP99- 608 (2)	WMTP99- 609 (4)	WMTP99- 633 (2)
<i>Tanacetum vulgare</i>	0	0	0	2	0	0
<i>Taraxacum officinale</i>	4	1	2	1	0	1
<i>Taxus brevifolia</i>	0	0	2	0	0	0
<i>Thalictrum occidentale</i>	0	0	3	0	4	0
<i>Thalictrum spp.</i>	4	2	0	0	0	2
<i>Thelypodium spp.</i>	1	0	0	0	0	0
<i>Thuja plicata</i>	0	0	0	2	0	0
<i>Tiarella trifoliata</i>	0	0	1	2	0	0
<i>Trifolium spp.</i>	4	0	0	1	0	2
<i>Trillium ovatum</i>	0	1	0	2	0	0
<i>Trisetum spp.</i>	0	0	0	0	0	1
<i>Urtica dioica</i>	0	0	1	0	0	0
<i>Vaccinium membranaceum</i>	0	0	2	0	4	0
<i>Vaccinium myrtillus</i>	0	0	0	0	4	0
<i>Vaccinium scoparium</i>	3	0	0	0	2	1
<i>Vaccinium spp.</i>	1	0	0	2	0	0
<i>Veronica spp.</i>	0	0	2	0	0	0
<i>Viola spp.</i>	3	1	1	2	0	1